The Corner Clear Beam™

Introduction

The Angle Pivot™ devices, which have been the focus of our efforts to date, are made to operate in a finishing system with inclines and declines, a relatively flat ware package, and a need or a desire for a production increase. Early in our contacts with customer prospects and continuing since, situations have been presented in which a similar increase was desired on a system running large square planform ware packages. Prime examples are appliance cabinet lines, monorail E-coating lines, and porcelain furnace conveyors.

For these systems, a touch of the vertical edges of adjacent ware packages in the horizontal turns establishes minimum spacing distance along the conveyor chain, providing the inclines and declines are relatively shallow. In these situations, mounting the work pieces at the trailing end of a short cantilever beam can provide a useful increase in the capacity of the system.

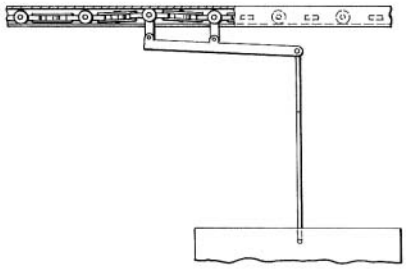

Figure 1. Corner Clear Beam™ on internalchain conveyor–note leading wheels in contact with top of track.

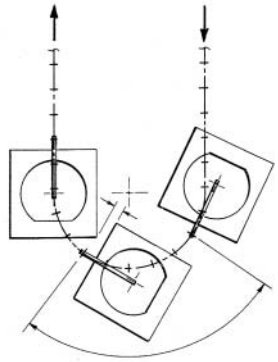

Figure 2. Appliance cabinets on Corner Clear Beams, in minimum clearance position.

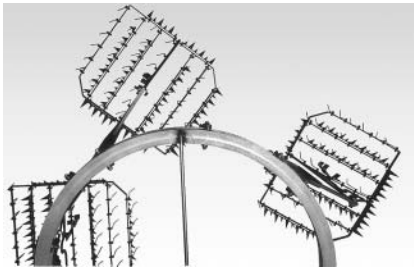

Figure 3. E-Coat racks on Corner Clear Beams. View from above track with roller nests removed.

Design

In principle the devices are vanilla-simple, consisting of a bar attached to the monorail chain at the leading end and an intermediate point, and carrying the rack or part at the trailing end (Figure 1). It can readily be seen that on the horizontal turns, this will move the part out to a greater radius than that of the conveyor centerline, resulting in a proportionately greater corner clearance between the ware packages (Figure 2 & 3) as the parts progress through the turn. On straight runs the parts return to track directly beneath the conveyor.

Many variations of the design are possible; in fact unlike the Angle Pivot™ devices every system needs a customized tool. Integral C-hooks, multiple rack hanging points, and clearance notches in the beams to accommodate the preceding beam, are a few of the variations to date (Figure 4, 5 & 6). Sequenced beams of increasing length, installed in a repeating pattern, permit racks to be spaced at non-integral trolley or wheel-set spacing (Figure 7).

Optimizing Incline/Decline Angles and Horizontal Turn Radii

An interesting calculation exercise can be done to develop a feel for the applicability of the beam devices to a given system. This came to light during work on a monorail E-coat priming line which was equipped with Angle Pivot™ load bars to permit non-trolley center spacing of square ware package racks.

Due to floor space constraints, the conveyor was designed with 45° incline and decline angles rather than the more customary 30°. Horizontal turns were generous, at a 48" radius, because long double-hung ware packages were anticipated. Ware package width perpendicular to the plane to the conveyor was 30" but could easily be

AP CONVEYOR CORPORATION
400 South Westwood Avenue • Toledo, Ohio 43609 USA
419-385-2765 • Fax: 419-385-8372 • Email: info@apconveyor.com • www.apconveyor.com

Figure 4. Corner Clear Beam with integral C-hook and rotator.

Figure 5. Corner Clear Beam with load bar rear mounting. Rear hook used for maximum line density; front hook for maximum weight capacity.

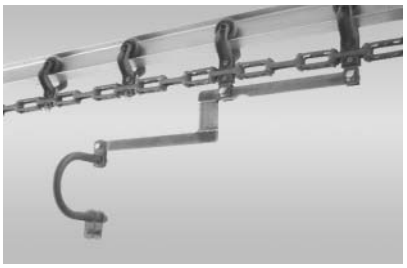

Figure 6. Corner Clear Beam with integral C-hook-another example.

Figure 7. Corner Clear Beams of graduated lengths give non-integral trolley spacing capability.

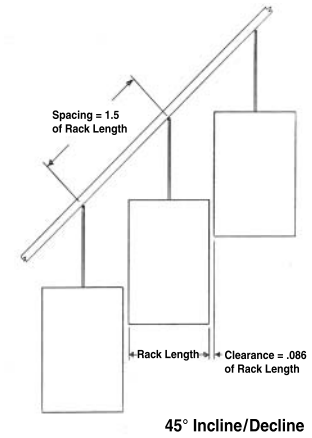

Figure 8. Ware packages on 45° incline.

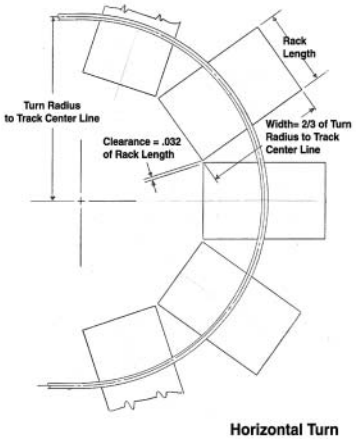

Figure 9. Ware packages in horizontal turn.

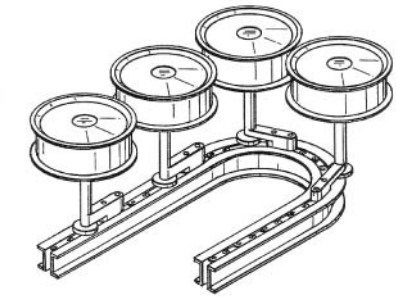

Figure 10. Chain-on-Edge Machine application of Corner Clear beams.

stretched to 32" or more. The line was tooled with the aforementioned load bars plus universal picture frame racks of 30" width, running perpendicular to the direction of travel. Within these frames, specialized crossbars are used to carry many different shaped and sized parts, at 14" to 68" conveyor spacing.

A familiar calculation shows that the minimum safe rack spacing on a conveyor with 45° incline/decline angles is 1.5 x the rack dimension in the up-and-down line direction (Figure 8). Running the numbers for corner clearance in the horizontal turns, one quickly sees that the optimum ware package width, where the clearance on inclines and declines and horizontal turns disappears simultaneously, is at a ware package width of 2/3 of the horizontal turn radius, regardless of the size of the parts (Figure 9). Quite by accident, this line is perfectly proportioned for maximum throughput of all square ware packages.

Conclusion

The line in this example has steeper incline/decline angles and greater horizontal turn radii than those incorporated in most finishing lines. The shallower the slopes and the tighter the turns, the more favorable the use of the beam device in a square ware package situation becomes. In some cases it is possible to use the load bars to handle flat ware packages, and make the trailing part of the beam as an integral part of the rack to handle square ware package parts at reduced spacing, on the same line at the same time. Figure 2 is scaled to show 27" square washing machine cabinets on a 24" radius horizontal turn. Here productivity gain was 20%; a typical result. Similar increases can be realized on Chain-on-Edge machines with another variant (Figure 10).